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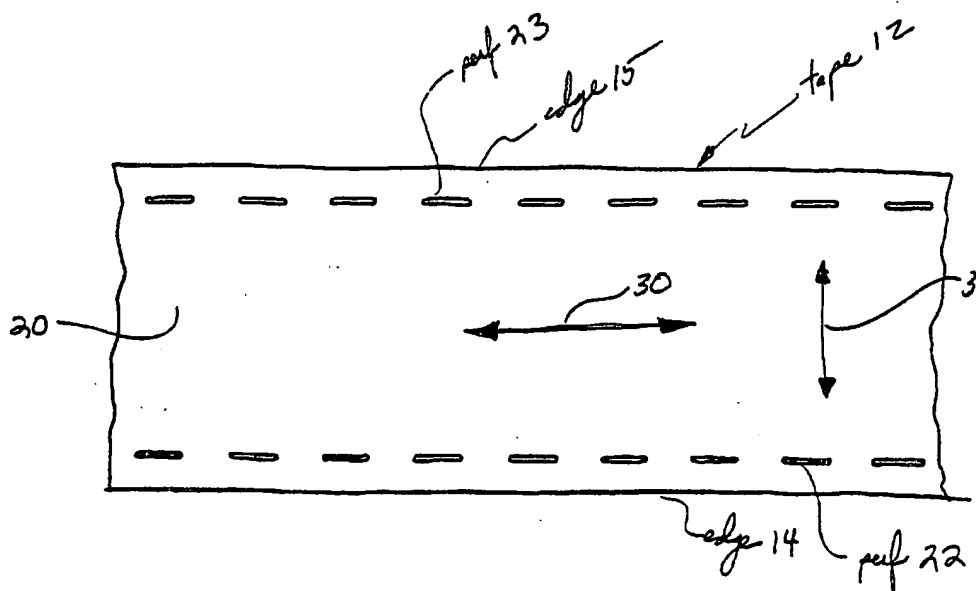
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- For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: TAPE HAVING FINGER-TEARING FEATURE



(57) Abstract: A tape defines an elongated base member having generally parallel edges which is wound upon a core to form a tape roll. The tape defines an undersurface which supports an adhesive layer and an outer surface. A pair of perforated lines formed of linear arrangements of perforations are formed within the tape adjacent to and spaced inwardly from the tape edges. The perforations are variously shaped and include elongated slots and circular apertures. The perforations facilitate a tearing action which initiates fracture of the tape material during finger or hand tearing which commences or initiates from inside the tape edges.

WO 01/12744 A1

TAPE HAVING FINGER-TEARING FEATURE

5

SPECIFICATION

Field of the Invention

10 This invention relates generally to adhesive tapes and particularly to those providing a finger or hand tearing feature.

Background of the Invention

15 Adhesive tapes have become a common staple of commerce and manufacturing. A virtually endless variety of adhesive tapes are utilized in assembly, packaging, or other manufacturing and distributing processes of many products. In addition, adhesive tapes enjoy great popularity and use among practitioners of
20 various arts, crafts and hobbies. The various types of adhesive tapes utilized in commercial manufacturing, distributing and packaging operations are often referred to as "packing tape" or "packaging tape" and while such tapes differ such substantially in their fabrication, all basically utilize one or more elongated
25 base layers formed of a high strength material supporting an interior layer of adhesive on one side thereof. Typically, the adhesive tape is rolled or wound upon a conveniently sized roll

and is dispensed in the desired amount by simply unwinding or unrolling a quantity of tape and severing the tape quantity from the remainder of the roll. This process is often referred to as tape application or dispensing. The process by which the tape is
5 cut or torn to separate a quantity of dispensed tape from the remainder of the tape roll has itself been the subject of substantial tape development among practitioners in the art.

Early adhesive tapes generally employed base layers formed
10 of paper or cloth material which by its nature is relatively easy to hand or finger tear in order to sever the dispensed tape. With the advent of high strength plastic type base layer materials, however, adhesive tapes were no longer found to be easily finger or hand tearable. Such plastic materials are
15 utilized in tape manufacture because of their desirable characteristic of high tensile strength. A typical material utilized is polypropylene alone or in combination with other cooperating materials. The high strength and lack of tearable structure of such tapes necessitated the use of a cutting tool in
20 the dispensing process.

Because the presence of cutting tools in the vicinity of working employees poses a potential safety hazard and because the need to stop and utilize such tools in the taping process is
25 inefficient, practitioners in the art have endeavored to provide a high strength tape which is nonetheless hand or finger tearable. In attempting to provide high strength plastic

material type tapes which may be finger or hand torn, practitioners in the art have attempted to utilize either of two basic approaches. The first of these approaches attempts to impart a desired characteristic which maintains strength while providing hand tearing in the formulation or fabrication of the tape material itself. The second approach focuses attention on altering the structure of the base layer of the tape to facilitate easy tearing.

With respect to approaches to this problem focused upon the tape material and fabrication, practitioners have employed various blends of different materials, multiple layers or laminations of different materials or addition of filler materials. For example, U.S. Patent 4,716,068 issued to Seifried, et al. sets forth a POLYPROPYLENE ADHESIVE TAPE in which the tape is based upon a co-extruded three-layer polypropylene base film which has been biaxially stretch-oriented in at least three stages and has been subjected on at least one side to corona treatment.

U.S. Patent 4,393,115 issued to Yoshii, et al. sets forth a MULTI-LAYERED POLYPROPYLENE FILM having a laminated stretched thin propylene-ethylene block copolymer layer formed on the surface of a laminate film having a biaxially oriented polypropylene layer and a polypropylene layer uniaxially oriented in the width direction.

U.S. Patent 3,887,745 issued to Yoshii, et al. sets forth a FINGER-TEARABLE ADHESIVE TAPE having a base component comprised of a biaxially oriented film of propylene polymer and a
5 transversely oriented film of a propylene polymer. The melting points of the polymers are carefully selected.

U.S. Patent 4,513,028 issued to Aritake sets forth an ADHESIVE TAPE AND PROCESS FOR ITS PRODUCTION having a base sheet
10 of polypropylene resin, an adhesive layer formed on one side of the base sheet and a roughened surface layer formed on the remaining side of the base sheet. The roughened surface layer of the base sheet is composed of a polypropylene resin containing fine inorganic filler particles. The object of this combination
15 is the provision of a tape which is hand tearable.

U.S. Patent 4,410,582 issued to Tsunashima, et al. sets forth a MULTI-LAYERED POLYOLEFIN LAMINATED FILM consisting of a center layer of a crystalline low molecular weight polyolefin and
20 two surface layers disposed on each side thereof consisting of a crystalline polyolefin having a melting point higher than that of the low molecular weight polyolefin.

While the above-described prior art approaches to employ
25 material blending or laminating or the addition of fillers to the base material have resulted in some improvement in the tearability of tapes, they are for the most part unduly costly

and in some instances sacrifice the tape strength to achieve their tearable characteristics.

U.S. Patent 4,851,064 issued to Darbo sets forth a TEAR-OFF
5 TAPE AND METHOD OF MAKING SAME in which a plastic tape such as pressure sensitive plastic adhesive tape is wound upon a roll and at least one edge of the tape is provided with a series of closely spaced points of weakness such as shallow slits or notches. Such points of weakness may be formed in the tape prior
10 to rolling upon a supply roll or may be imposed by working the flat side of a roll with a sharp grit sandpaper or the like or by cutting means.

U.S. Patent 5,366,775 issued to Kao sets forth a EASE-
15 PEELING AND SAFE-DISPENSING TAPE ROLL FOR PACKING OR SEALING in which a roll of continuous tape is provided with a strip-like area in the middle of the lateral span of the tape which is free of adhesive material. The strip-like area is also provided with a plurality of spaced punch holes of various shapes such as
20 linear or circular or the like. The lack of adhesive material and spaced holes facilitate the location and peeling of the starting end of the tape and make the tape easily torn with the hands or fingers.

25 U.S. Patent 4,647,485 issued to Nelson sets forth a PACKAGING TAPE made from a flexible member having a top and bottom surface. A central tear-away portion is formed by two

parallel lines of perforations extending the length of the flexible member. Finger openings located each of the lines of perforations at spaced intervals expose the central tear-away portion to facilitate severing the flexible member

5 longitudinally.

While approaches to providing tearable tapes heretofore utilized such as those described above have, in some instances, produced tapes which may be hand or finger torn, the various
10 weaknesses and deformities introduced into the tape material has proven to be difficult to maintain with uniformity in the manufacturing process. Practitioners in the art have found that such tapes require the use of a release coat in order to make the unwinding force of the tape low enough to avoid tearing. In
15 addition, such weaknesses or deformities while providing tearability often reduce the linear strength of the tape to an undesired degree. Thus, in utilizing such approaches to providing tearable tape, practitioners have often found that the manufacturing process has become unduly difficult and tedious as
20 they attempt to control the process and provide uniform tape characteristics.

There remains therefore a continuing unresolved need in the art for a finger or hand tearable tape which provides uniform
25 characteristics of tape strength and tearing characteristics within a cost-effective and readily controlled manufacturing environment.

Summary of the Invention

Accordingly, it is a general object of the present to
5 provide an improved adhesive tape. It is a more particular
object of the present invention to provide an improved adhesive
tape which maintains a finger or hand tearing feature without
sacrificing the tensile strength of the tape material. It is a
still further object of the present invention to provide an
10 improved tape having a finger tearing feature which may readily
be manufactured in a uniform manner.

Thus, the present invention focuses upon the characteristic
of such finger or hand tearing tapes during the stressing and
15 tearing process. It has been found that during lateral tearing,
the tape is twisted such that each longitudinal section of the
tape near the twisted edge is stressed and stretched. This
stretch rate is maximum at the outer edge of the tape and
decreases toward the center of the tape. In tapes having an edge
20 defect such as an edge crush or cut or series of notches, the
stress is concentrated therein and breakage of the tape occurs
from the outside of the tape inwardly. The inventive structure
provides a plurality of apertures or other defects inside the
tape edge rather than along the outer edge. In this structure,
25 the stress is still concentrated within the defects near the edge
but requires a larger force to initiate breakage or tearing. The
present invention utilizes a particular set of geometries which

allow this tearing or breakage to be achieved with a reasonable twisting or tearing force while allowing the tape to retain its integrity during manufacture and dispensing. One important aspect of the present invention is found in its ability to tear
5 from a point inside the tape rather from the outer edge. This allows the tape to remain intact during manufacture and unwinding of the tape from a finished roll. Moreover, thinner tape films may be processed without risks of manufacturing defect.

10 In accordance with the present invention, there is provided an adhesive tape having a hand or finger tearable characteristic, the adhesive tape comprising: an elongated base member defining a longitudinal direction and a lateral direction and generally parallel edges; and at least one perforated line spaced inwardly
15 from and adjacent to one of the edges, the perforated line formed by a plurality of perforations formed in the base member.

Brief Description of the Drawings

20 The features of the present invention, which are believed to be novel, are set forth with particularity in the appended claims. The invention, together with further objects and advantages thereof, may best be understood by reference to the following description taken in conjunction with the accompanying
25 drawings, in the several figures of which like reference numerals identify like elements and in which:

Figure 1 sets forth a perspective view of a tape roll constructed in accordance with the present invention;

5 Figure 2 sets forth an enlarged view of a portion of the present invention finger tearable tape;

Figure 3 sets forth a partial enlarged view of the present invention tape illustrating the initiation of finger tearing;

10

Figure 4A sets forth an enlarged view of the elongated apertures formed in the present invention tape as shown in the embodiments of Figures 1 through 3;

15 Figure 4B sets forth an enlarged partial view of an alternate embodiment of the present invention finger tearable tape;

Figure 4C sets forth an enlarged partial view of a further alternate embodiment of the present invention finger tearable tape; and

20 Figure 4D sets forth an enlarged partial view of a still further alternate embodiment of the present invention finger tearable tape.

25

Description of the Preferred Embodiments

Figure 1 sets forth a perspective view of a tape roll constructed in accordance with the present invention and generally referenced by numeral 10. Tape roll 10 includes an internal cylindrical core 11 upon which a quantity of elongated tape 12 has been wound. Tape 12 terminates in an outer end 13 which, for purposes of illustration is shown partially unwound from tape roll 10. Tape 12 further defines parallel edges 14 and 15 on each side of tape 12 as well as an outer surface 20 and an undersurface 21. Undersurface 21 supports an adhesive layer 27 which covers the entirety of undersurface 21. It will be understood that the thickness of adhesive layer 27 relative to the thickness of tape 12 has been exaggerated for purposes of illustration. Tape 12 may be fabricated utilizing conventional materials such as polypropylene or other suitable high strength materials of the type generally utilized in manufacturing high strength packaging type tapes or the like.

In accordance with the present invention, tape 12 further defines a line of perforations 23 extending alongside and parallel to edge 15. Perforations 23 are inwardly spaced from edge 15 in accordance with the manufacturing parameters described below in Figure 4A in greater detail. Suffice it to note here that perforations 23 form a perforations line which is substantially close to edge 15 relative to the width of tape 12. In further accordance with the present invention, a second

plurality of perforations 22 form a perforations lines generally parallel with and inwardly spaced from edge 14. In accordance with the preferred fabrication of the present invention, perforations 22 and 23 are formed as elongated slots which are positioned in a generally evenly spaced arrangement alongside edges 14 and 15. It will be noted that Figures 4A through 4D show various alternative shapes for perforations 22 and 23. However, it has been generally determined that the elongated slot having rounded ends shown in Figure 4A and represented in Figure 1 is preferable for most tape materials.

With tape 12 wound upon core 11 to form tape roll 10, tape 12 defines a longitudinal direction indicated by arrows 30 and a lateral direction indicated by arrows 31. In accordance with the present invention and as is described below in greater detail, tape 12 exhibits a high strength for stresses in longitudinal direction 30 while simultaneously being finger or hand tearable in lateral direction 31. Thus, in the intended use of tape roll 10, a quantity of tape is dispensed from tape roll 10 by drawing end 13 away from the tape roll overcoming the adhesive force of adhesive layer 27 upon undersurface 21 and drawing a segment of tape 12 outwardly. The dispensed or withdrawn end of tape 12 may then be applied to the desired packaging or the like after which the user is able to tear tape 12 at a desired point by grasping one side of tape 12 and twisting the gripped tape portion to impose a stress upon tape 12. In the manner set forth below in Figure 3 in greater detail, the presence of perforations 22 or 23

on either side of tape 12 facilitate the creation of lateral tearing of tape 12 which separates the desired tape portion from the remainder of tape roll 10. In accordance with an important aspect of the present invention, the provision of this finger or
5 hand tearable characteristic of tape 12 is achieved with very little, if any, reduction of strength of tape 12 in longitudinal direction 30.

Figure 2 sets forth an enlarged portion of tape 12 having
10 perforations 22 and 23 forming perforation lines adjacent edges 14 and 15 respectively. As described above, tape 12 defines an outer surface 20 and an undersurface 21 (seen in Figure 2). As is also described above, tape 12 defines a longitudinal direction 30 extending the length of tape 12 and a lateral direction 31
15 extending crosswise of tape 12. As is mentioned above, the preferred fabrication of tape 12 for most tape materials used in forming the tape base utilizes evenly spaced perforations 22 and 23 which form elongated slots having rounded ends. However, it will be understood that other shapes of perforations may be
20 utilized in forming lines of perforations adjacent the edges of tape 12 without departing from the spirit and scope of the present invention. Toward this end, Figures 4A through 4D set forth below illustrate alternative shapes of perforations. It will be understood, however, that the shapes of the various
25 perforations shown in Figures 1 and 2 as well as Figures 4A through 4D are provided as illustrative of the present invention and should not be regarded as limiting. It will be apparent to

those skilled in the art that differently shaped apertures and perforations may be used to form perforation lines in accordance with the present invention without departing from the spirit and scope thereof. The essential feature of the present invention is

5 the provision of at least one perforation line adjacent at least one edge of the inventive tape to facilitate shearing or tearing from an inside/out position as the user twists the tape. The term inside/out tearing as used herein refers to tearing or fracturing of the tape which is initiated inside of the tape edge

10 rather than being initiated at the tape edge. In the typical fabrication of the present invention tape, tearing may occur simultaneously or closely timed in both an inside outwardly extending shear and inwardly extending shear. In such case, however, the initiation of fracturing or shearing of the tape

15 commences inside the tape edge. It will be also apparent to those skilled in the art that while Figure 2 shows the present invention tape utilizing a pair of perforated lines adjacent each edge of tape 12, the present invention tape may be fabricated if desired using a single perforated line adjacent one edge of the

20 tape. However, it has been found advantageous for most tape materials to utilize a pair of perforated lines adjacent each edge of the tape.

Figure 3 sets forth a partial view of a portion of tape 12

25 illustrating the initiation of a finger or hand tear action. As described above, tape 12 defines an edge 15 having a plurality of perforations 23 forming a perforation line near edge 15. As is

also described above, tape 12 defines a longitudinal direction 30 and a lateral direction 31. For purposes of illustration, a twisting or tearing force in the direction indicated by arrow 32 is applied to tape 12 which stresses the tape material and in accordance with the present invention initiates a fracture 25. In accordance with the present invention, fracture 25 begins at end 24 of perforation 23 and extends outwardly toward edge 15 and inwardly in general correspondence to lateral direction 31. Of importance with respect to the present invention is the recognition that fracture 25 initiates inside of edge 15 rather than beginning at edge 15 and extending inwardly therefrom. This inside/out tearing action of the present invention tape facilitates the maintenance of high tensile strength in longitudinal direction 30 while facilitating finger tearing in lateral direction 31. Thus, in accordance with the present invention, tape 12 tears from the inside rather than from either of the outer edges of the tape.

Figures 4A through 4D set forth partial enlarged views of alternate embodiments of the present invention tearable tape which differ in the shape of perforation utilized to form perforation lines adjacent the tape edge. As mentioned above, the shapes shown in Figures 4A through 4D are illustrative and by no means limiting in that other shaped perforations may be utilized without departing from the spirit and scope of the present invention.

More specifically, Figure 4A shows an enlarged view of a portion of tape 12 having an edge 15 and an outer surface 20. A plurality of perforations 23 form a perforation line adjacent edge 15 and spaced inwardly therefrom by a distance indicated by the letter "c". Perforations 23 define generally elongated slots having rounded ends 24 and 26. For purposes of illustration, the length of perforations 23 is indicated by dimension "a" while the spacing between successive perforations is indicated by dimension "b". It has been found that the finger tear characteristics as well as tensile strength of the present invention tape may be optimized in fulfilling a particular overall tape characteristic by adjusting dimensions a, b and c as needed. For example, increasing spacing b tends to reduce the number of locations upon the tape at which the tearing or fracturing occurs during the finger tear process. Similarly, increasing the spacing of perforated line from its adjacent edge (dimension c) tends to increase the breaking force of the tape. For example, a conventional size packing tape having a tape width of forty to fifty millimeters may utilize perforation spacing and dimensions in which dimension a is 1 to 2 millimeters, dimension b is between 0.5 millimeters and 1.5 millimeters and dimension c is 1 millimeters to 2 millimeters. These dimensions are merely illustrative and represent a typical set of dimensions for a tape. Furthermore, the above dimensions (a, b and c) may be adjusted to provide different tearing strengths. Accordingly, the present invention will be understood to be applicable to a

wide range of materials having different strengths and thicknesses.

Figure 4B sets forth an enlarged partial view of an alternate embodiment of the present invention tape generally referenced by numeral 40. Tape 40 defines an edge 41 and a line of perforations 42 spaced inwardly from and generally parallel to edge 41. In the embodiment of Figure 4B, perforations 42 define generally rectangular shapes having square ends such as ends 43 and 44.

Figure 4C sets forth an enlarged partial view of a further alternate embodiment of the present invention tearable tape generally referenced by numeral 50. Tape 50 defines an edge 51 and a line of perforations 52. Perforations 52 define pointed ends 53 and 54.

Figure 4D sets forth an enlarged partial view of a still further alternate embodiment of the present invention tearable tape generally referenced by numeral 60. Tape 60 defines an edge 61 and a line of perforations 62 parallel therewith. In the embodiment of Figure 4D, perforations 62 are generally circular in shape.

What has been shown is a tape having a finger tearing feature which maintains the tensile or longitudinal strength of the tape while providing a convenient finger or hand tearable

feature. The inventive tape utilizes perforations inwardly spaced from the tape edge or edges to create an inside fracture or shear of the tape material as the user tears the tape. In this manner, the tape of the present invention tears from the
5 inside rather than from an outer edge.

While particular embodiments of the invention have been shown and described, it will be obvious to those skilled in the art that changes and modifications may be made without departing
10 from the invention in its broader aspects. Therefore, the aim in the appended claims is to cover all such changes and modifications as fall within the true spirit and scope of the invention.

THAT WHICH IS CLAIMED IS:

1. An adhesive tape having a hand or finger tearable characteristic, said adhesive tape comprising:

an elongated base member defining a longitudinal direction and a lateral direction and generally parallel edges; and

at least one perforated line spaced inwardly from and adjacent to one of said edges, said perforated line formed by a plurality of perforations formed in said base member.

2. The adhesive tape set forth in claim 1 wherein said perforations are generally elongated slots.

3. The adhesive tape set forth in claim 2 wherein said elongated slots define semicircular ends.

4. The adhesive tape set forth in claim 2 wherein said elongated slots define generally square ends.

5. The adhesive tape set forth in claim 2 wherein said elongated slots define generally pointed ends.

6. The adhesive tape set forth in claim 1 wherein said perforations are generally circular.

7. A finger tearable tape comprising:

an elongated base member having generally parallel edges, an outer surface and an undersurface;

a core receiving said elongated base member wound thereon to form a tape roll; and

at least one perforated line formed in said base member proximate to and spaced inwardly from one of said edges.

8. The finger tearable tape set forth in claim 7 further including an adhesive coating supported upon said undersurface.

9. The finger tearable tape set forth in claim 8 wherein said at least one perforated line includes a plurality of perforations formed in said base member.

10. The adhesive tape set forth in claim 9 wherein said perforations are generally elongated slots.

11. The adhesive tape set forth in claim 10 wherein said elongated slots define semicircular ends.

12. The adhesive tape set forth in claim 10 wherein said elongated slots define generally square ends.

13. The adhesive tape set forth in claim 10 wherein said elongated slots define generally pointed ends.

14. The adhesive tape set forth in claim 9 wherein said perforations are generally circular.

15. A finger tearable tape comprising:

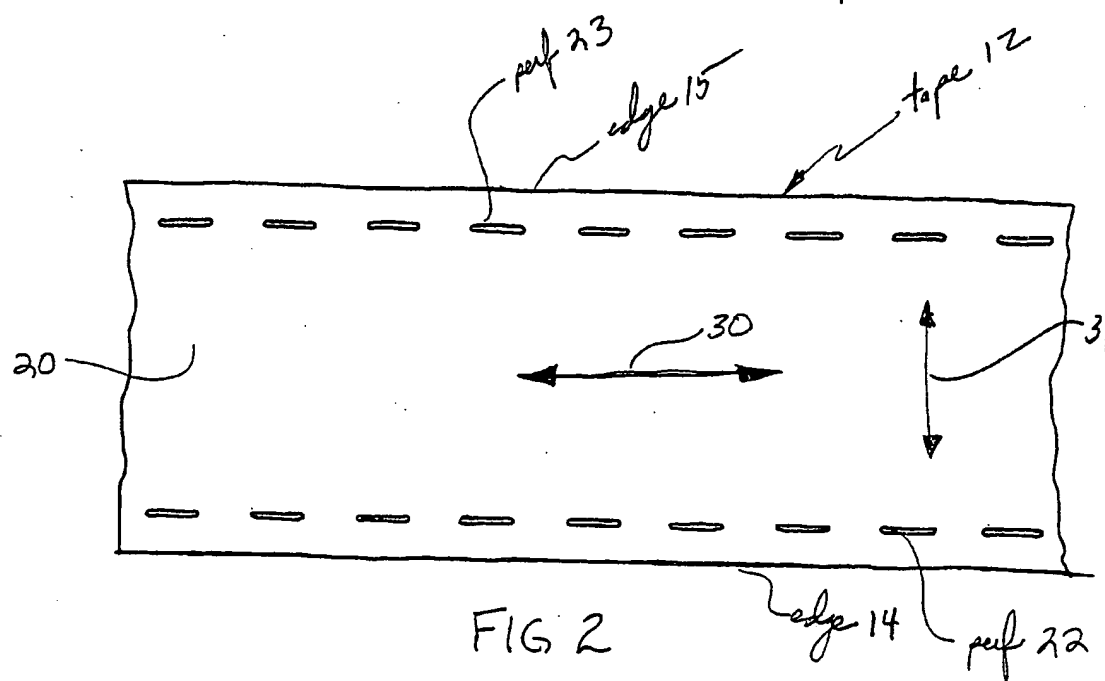
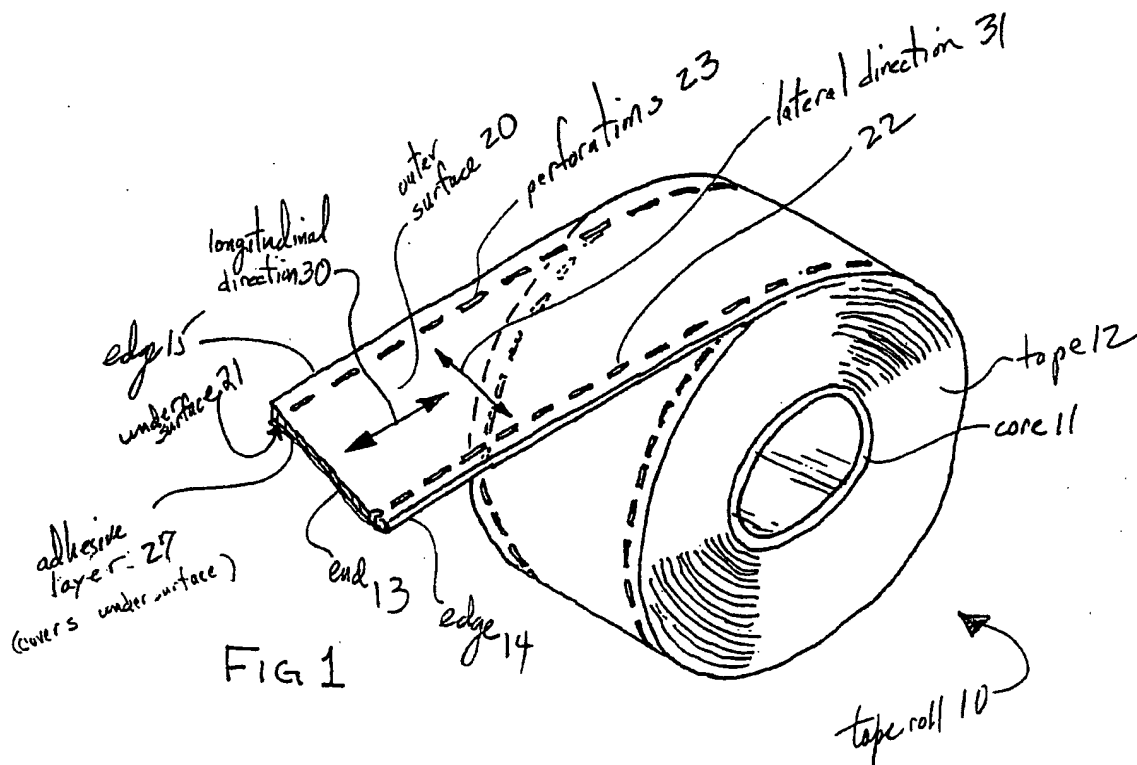
an elongated base member having a pair of generally parallel edges, an outer surface and an undersurface;

a core receiving said elongated base member wound thereon to form a tape roll;

an adhesive coating supported upon said undersurface;

a pair of perforated lines each formed in said elongated base member proximate to and spaced inwardly from one of said edges,

said perforated lines each being formed by a plurality of perforations which respond to finger tearing stress to fracture said base member initially inside said edges to initiate tearing of said tape.



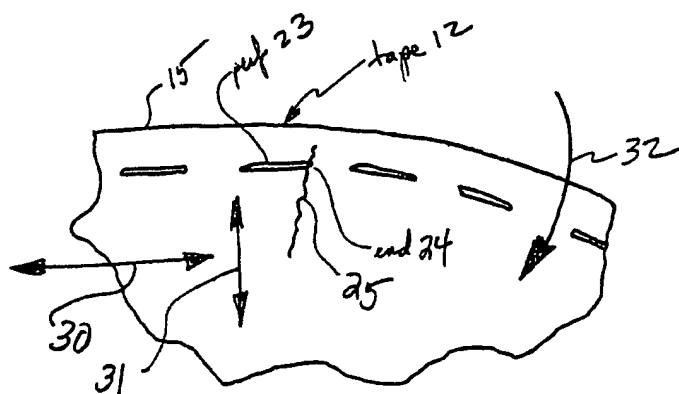


FIG 3

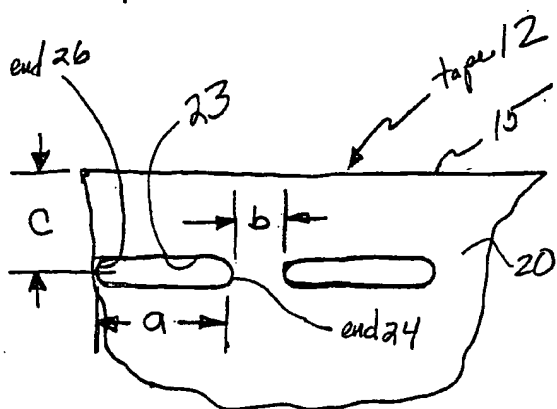


FIG 4A

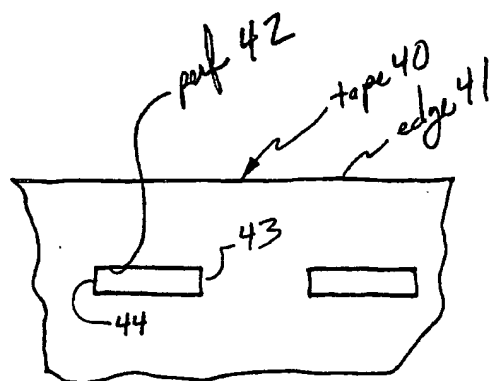


FIG 4B

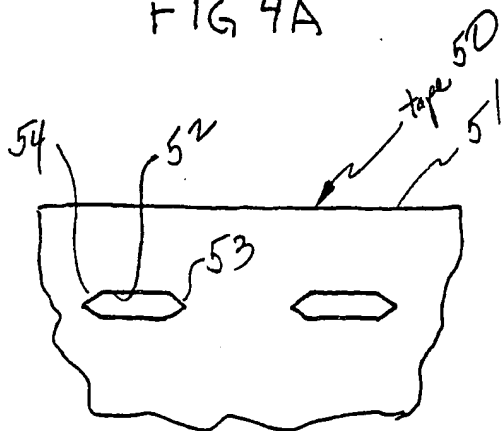


FIG 4C

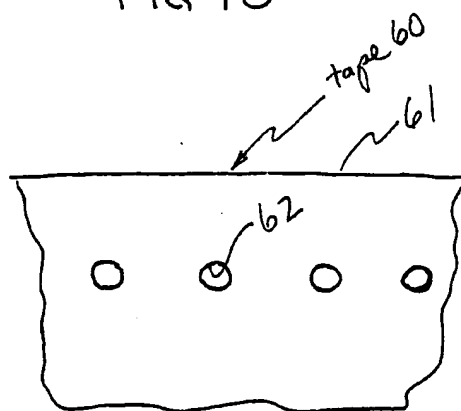


FIG 4D

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 00/22120

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 C09J7/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 C09J

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2 308 693 A (GOLDMAN JOSHUA H) 19 January 1943 (1943-01-19) page 1, left-hand column, line 50 -page 1, right-hand column, line 14 figure 1	1-15
X	US 5 366 775 A (KAO CHENG-KANG) 22 November 1994 (1994-11-22) cited in the application figure 4 column 3, line 24 - line 33	1-15
X	US 3 143 208 A (SIZEMORE HIRAM JR) 4 August 1964 (1964-08-04) figures 1,2 column 2, line 14 - line 20	1-15
	-/--	

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents:

- *A* document defining the general state of the art which is not considered to be of particular relevance
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- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- *Z* document member of the same patent family

Date of the actual completion of the international search

1 December 2000

Date of mailing of the international search report

13/12/2000

Name and mailing address of the ISA

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INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 00/22120

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	<p>US 2 399 545 A (DAVIS BERNARD E) 30 April 1946 (1946-04-30) figure 1 page 1, left-hand column, line 52 -page 2, left-hand column, line 2 -----</p>	1-15

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 00/22120

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2308693 A	19-01-1943	NONE	
US 5366775 A	22-11-1994	NONE	
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